Thermal Pipe Systems, Inc.

SUPER WELD-TITE® PIPING SYSTEM

FOR STEAM, HIGH TEMPERATURE HOT WATER, AND CONDENSATE SERVICE

SPECIFICATIONS & DRAWINGS

5205 W. WOODMILL DRIVE, SUITE 33
WILMINGTON, DELAWARE 19808
PHONE: 302.999.1588
WWW.THERMALPIPESYSTEMS.COM

SUPER WELD-TITE PIPING SYSTEMS SPECIFICATIONS

SUPER WELD-TITE shall be used where specified for steam, high temperature hot water, and condensate service. All straight sections, fittings, anchors, terminal end caps, field kits, and other accessories shall be factory prefabricated to job dimensions and designed to allow for thermal expansion and minimize the number of field welds. The pipe sections shall be joined by welding. The systems design shall be in strict conformance with ANSI B 31.1 latest addition.

STEEL CARRIER PIPE: Carrier pipe shall be black steel per ASTM A-53, Grade B **[welded][seamless]** or ASTM A-106 **[seamless],** schedule **[40]** (std. weight for 12"∅ - 16" ∅) or schedule **[80]** (extra heavy weight for 10"∅ - 16"∅).

INSULATION: The inner layer of insulation shall be **[CALCIUM SILICATE],** a rigid material satisfactory for temperatures to 1200°F conforming to ASTM C-533 and Mil Spec Mil-1-2781, or **[FOAMGLAS®]** a closed cell material satisfactory for temperatures to 900°F conforming to ASTM C-522 and Mil Spec Mil-1-24244B. Foamglas® shall be bore coated with Hydrocal B-11 to prevent abrasion of the insulation on the pipe.

The outer layer of insulation shall be POLYURETHANE FOAM and shall meet the following specifications:

Type:	Two component urethane
Compressive Strength:	40 psi parallel min at 5% comp
Shrinkage:	None at 70°F
Free Rise Density:	2.0 to 3.0 lbs/cubic foot
Aged "K" (70°F - 72 hrs)	0.160 BTU•inch/hour••°F•ft^2
Closed Cell Content:	90%

The urethane foam insulation shall completely fill the annular space between the inner insulation and the exterior casing. The carrier pipe shall be concentric to the casing pipe providing uniform thickness of the insulation.

FIBERGLASS CASING PIPE: The casing for Super Weld-Tite shall be reinforced thermosetting resin plastic (RTRP) pipe manufactured by the filament wound process per ASTM D-2310 (RTRP-12E).

INSULATED FITTINGS: Fittings shall be pre-insulated by Thermal Pipe Systems, Inc. using the same insulation thickness and casing as the pipe.

EXPANSION: Expansion may be accommodated by means of pre-fabricated and pre-insulated expansion loops and bends or with in-line expansion joints. Expansion loops and bends shall be pre-fabricated in an

oversized configuration to accommodate lateral movement of piping. No area or part of the piping shall be uninsulated due to pipe growth. The space provided for lateral movement shall be at least 1 1/2 times greater than the indicated piping movement. Support guides shall be installed where required to facilitate proper movement of the carrier pipe. The length of the oversized conduit shall not be less than that required to produce carrier pipe flexibility within the stress limits indicated by the ANSI B31.1 Code Pressure Piping. Carrier pipe shall be accurately centered inside the oval conduit at the factory and held in place with stays. Installer shall not remove stays before conduit is placed in its final location, backfill material is placed on both sides of oval conduit, and carrier pipe joints are made in oval conduit sections.

WALL PENETRATION SLEEVES: Provide wall penetration sleeves where piping passes through masonry or concrete walls, floors, and roofs. Sleeves in outside walls below and above grade, in floor, or in roof slabs, shall be Schedule 40 or standard weight coated black steel pipe or shall be as specified by the Design Engineer. Space between piping or insulation casing, and the sleeve shall be sufficient to allow proper water tight sealing, but never less than ½". Sleeves shall be held securely in proper position and location during construction. Sleeves shall be of sufficient length to pass through entire thickness of walls or slabs. Sleeves in floor slabs shall extend 2" above the finished floor. In existing concrete manholes or building walls, penetrations may be made using the "core drilling" method providing proper care is taken to drill the holes to the size needed and square to the line of pipe.

VENTING IN MANHOLES: Where manholes are required, it is the responsibility of the installer to utilize the N.P.T. outlet on pipe end cap with a gooseneck to the atmosphere above the manhole.

FIELD JOINTS: Field joints shall be made with a FRP sleeve, insulation half shells, FRP wrap kits, and a wrap around heat-shrinkable sleeve. The circumferential joint between the FRP sleeve and outer FRP jacket shall be covered with layers of pre-cut fiberglass mat and polyester resin provided by the system supplier. The FRP wrap material shall extend over the adjacent casing to form a homogeneous airtight closure. The joint shall be air tested at 5 psi for a period of 2 hours after the cure is complete utilizing the factory installed air tube running through the entire system. Backfilling shall not be started until the joint has passed the air test. After testing, joint shall be sealed with wrap around heat-shrinkable sleeve. The complete joint shall be installed in accordance with the manufacturer's requirements.

ACCESSORIES: System manufacturer shall provide all required accessories to make the system watertight. This shall include all end terminations, end seals, and gland seals.

INSTALLATION: A 6-inch layer of sand or fine gravel shall be placed and tamped in the trench bottom to provide uniform bedding for the pipe. The entire trench width shall be evenly backfilled with a similar material to the bedding in 6-inch compacted layers to a minimum height of 6 to 12 inches above the top of the insulated piping system. The remaining trench shall be evenly and continuously backfilled in uniform layers with suitable excavated soil to a minimum depth of 30".

The entire piping system installation shall be engineered by the system manufacturer. Complete installation drawings showing all expansion compensation, anchors, thrust blocks, insulation, and dimensions will be provided to the engineer for approval before fabrication commences. The contractor shall include any and all offsets that may be required to provide a complete installation in accordance with the existing conditions at the site and/or the requirements of the manufacturer's final installation drawings.

SUPER WELD-TITE APPLICATION ENGINEERING

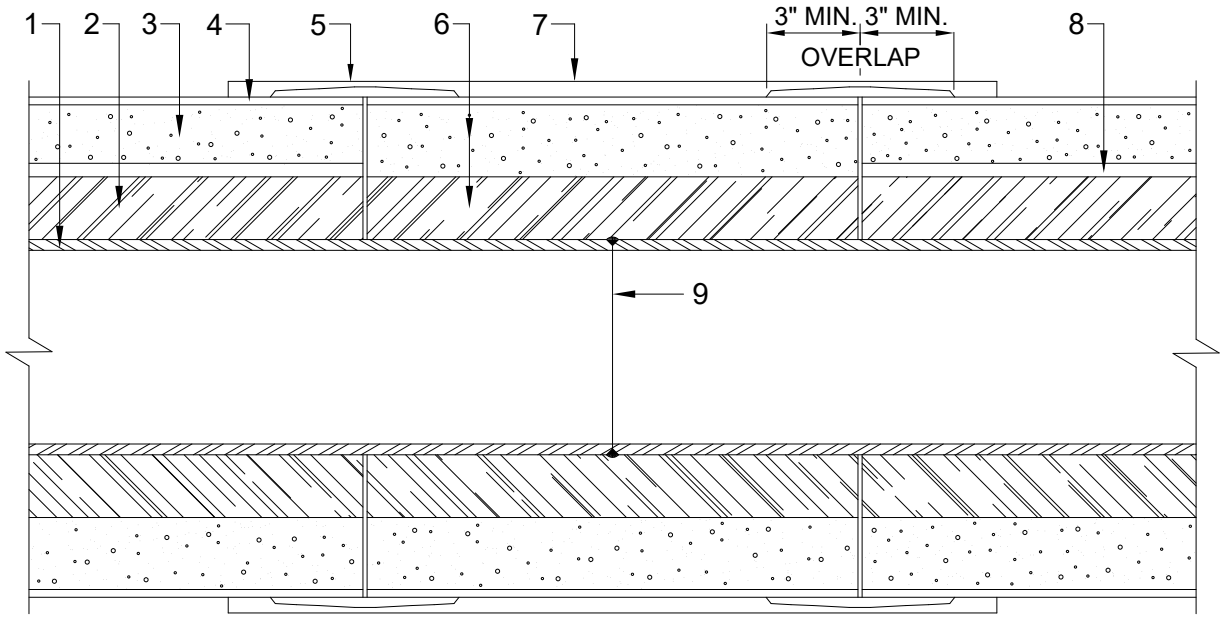
PIPE SYSTEM DESIGN: Standard design techniques and practices for Super Weld-Tite shall be used. Thermal Pipe Systems, Inc. Engineering Department may, on request, provide certain detailed design aspects of the piping for each project based on the project documents and drawings provided by the Design Engineer. It is understood that the project specifications and layout drawings will specify the type of service, location of the site, temperature and pressure classifications, soil conditions, general path and elevations of the system, location and design of manholes, known obstacles, size of the carrier pipe, and the maximum permissible heat losses. It is further understood that other requirements, such as the type of pipe, the location size and capacity of valves, traps, pumps, anchors, controls, expansion devices and special structural elements will be provided by the Design Engineer. The design provided by Thermal Pipe Systems, Inc. and their engineers for the piping will be in accordance with ANSI B31.1 and good engineering practices.

INSULATION: Thicknesses of insulation for Super Weld-Tite pipe, as shown on the page four, are for temperatures up to 450°F.

DIMENSIONS AND WEIGHTS: Dimensions and weights of insulated Super Weld-Tite piping and fittings are as shown on the following pages. The piping may be furnished in 20 ft. and/or 40 ft. lengths.

SPECIAL DESIGN: Special design of the Super Weld-Tite system components is the responsibility of the Design Engineer.

PRE-INSULATED SUPER WELD-TITE® PIPE



1. CARRIER PIPE: Black Steel as specified.

2. INITIAL INSULATION: Calcium Silicate or Foamglas® to provide high temperature insulation and reduce temperature to below limits of foam.

3. SECONDARY INSULATION: Polyurethane Foam to provide highly efficient insulation and support for carrier pipe along entire length.

4. OUTSIDE CASING: Fiberglass to protect the insulation from ground water and underground loads.

5. FIBERGLASS WRAP: Provides water tight seal at field joints.

6. FIELD JOINT HALF SHELLS: Provide the same efficient insulation and casing along the entire pipe run.

7. FIELD JOINT SEAL: Wraparound heat-shrinkable sleeve.

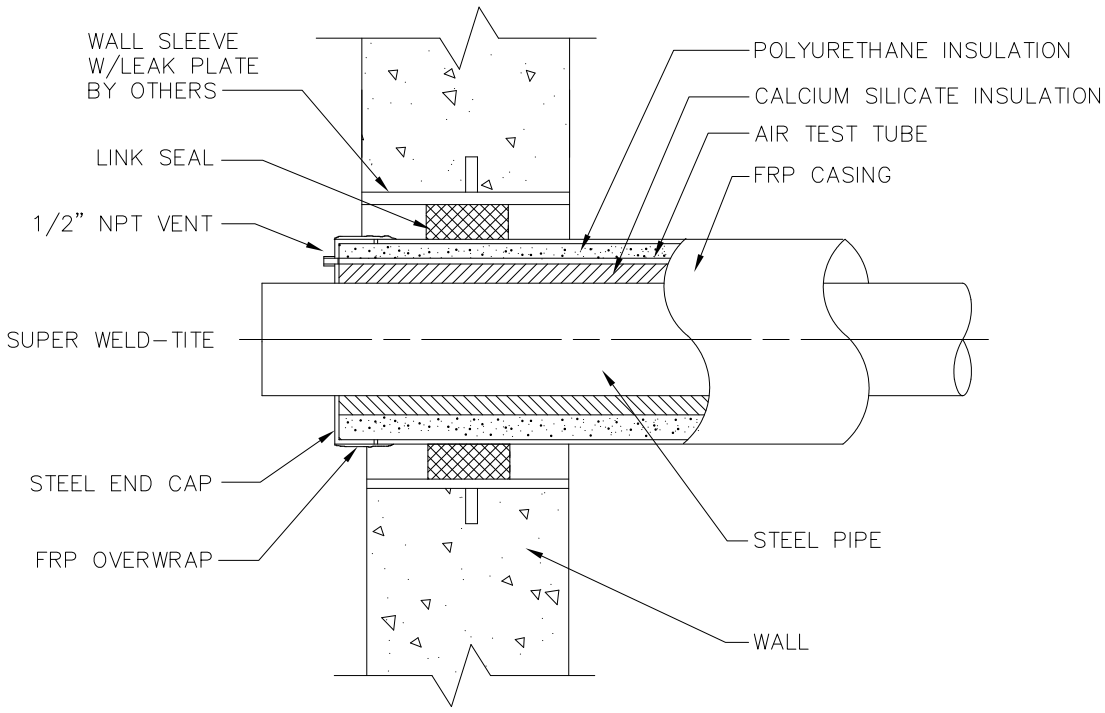
8. AIR TUBE: Copper tube for testing field joints.

9. WELD

NOM. PIPE SIZE	CARRIER O.D.	CASING O.D.	THICKNESS			WEIGHT (LBS./20 FT.)
			CASING	CALCIUM SILICATE or FOAMGLAS®	FOAM	
1 1/2	1.90	8.38	.185	1.00	2.05	144
2	2.38	8.38	.185	1.00	1.81	165
2 1/2	2.88	8.38	.185	1.00	1.56	210
3	3.50	8.38	.185	1.00	1.25	248
4	4.50	9.38	.185	1.00	1.25	335
5	5.56	12.38	.185	1.50	1.72	523
6	6.63	12.38	.185	1.50	1.19	615
8	8.63	16.50	.250	2.00	1.69	925
10	10.75	18.50	.250	2.50	1.13	1,252
12	12.75	20.50	.250	2.50	1.13	1,570
14	14.00	22.50	.250	2.50	1.50	1,822
16	16.00	24.50	.250	2.50	1.50	2,266

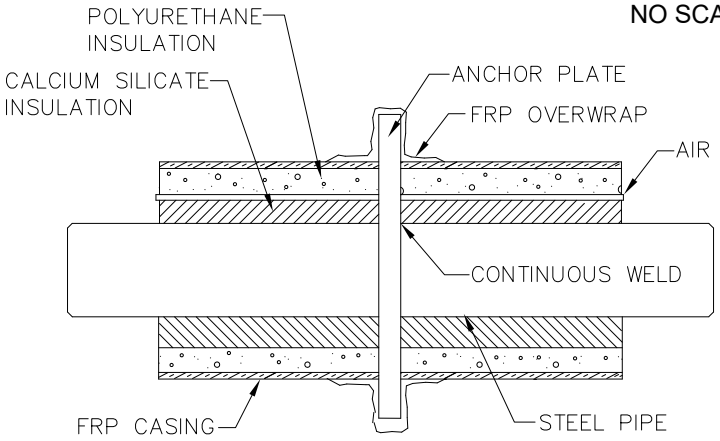
NOTE: All dimensions are in inches unless noted.

PRE-INSULATED SUPER WELD-TITE® PIPE



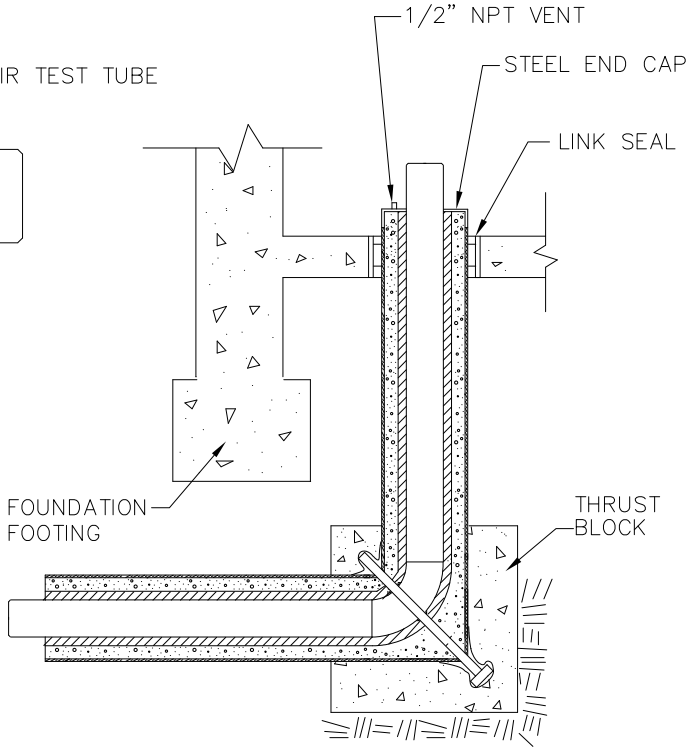
WALL PENETRATION DETAIL

NO SCALE



IN-LINE ANCHOR DETAIL

NO SCALE

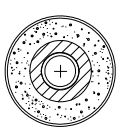


TYPICAL RISER AT BUILDING ENTRANCE

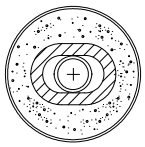
NO SCALE

PRE-INSULATED SUPER WELD-TITE® PIPE

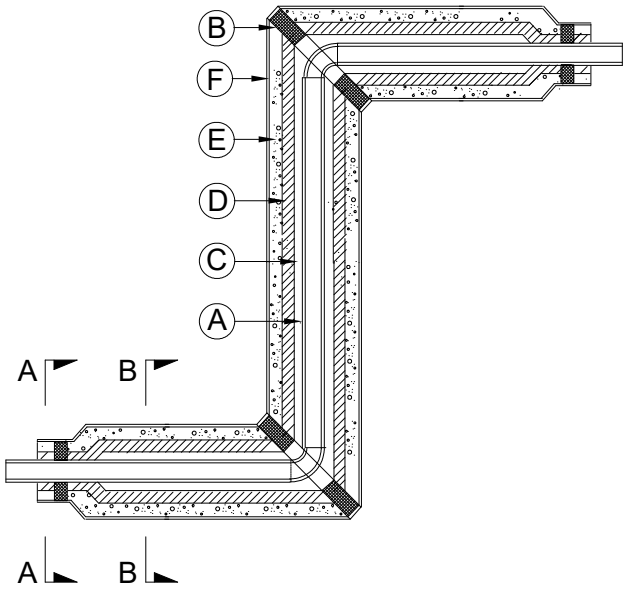
Ⓐ STEEL CARRIER PIPE
Ⓑ GUIDE
Ⓒ AIR SPACE
Ⓓ CALCIUM SILICATE INSULATION
Ⓔ POLYURETHANE INSULATION
Ⓕ FRP CASING



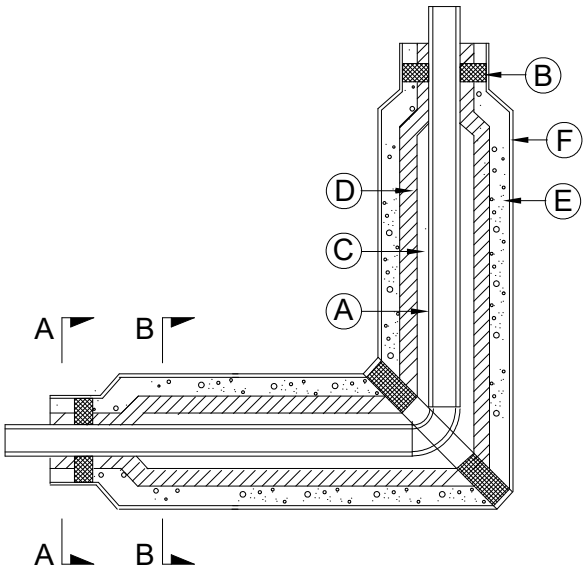
SECTION A-A



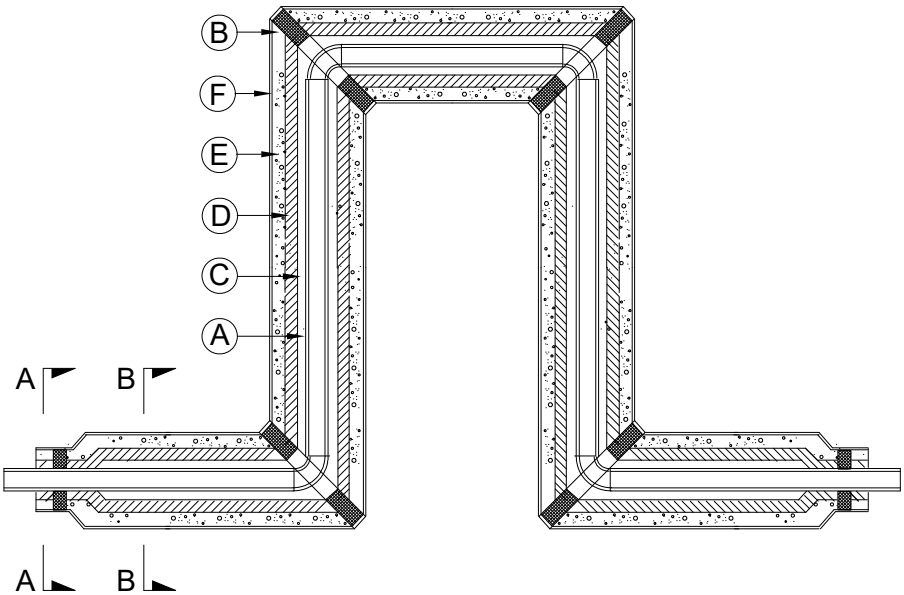
SECTION B-B



EXPANSION "Z" BEND DETAIL
NO SCALE



EXPANSION ELBOW DETAIL
NO SCALE



EXPANSION LOOP DETAIL
NO SCALE

SUPER WELD-TITE PIPING INSTALLATION SPECIFICATION

GENERAL: Installation of the Super Weld-Tite piping system shall be done in accordance with the appropriate publications including ANSI B31.1 and the following specifications and instructions. A Thermal Pipe Systems, Inc. field representative will conduct an installation clinic to pre-qualify contract personnel in the proper procedures for the installation. Good workmanlike procedures shall be followed.

All piping, unless other wise indicated, shall be pitched with a grade of not less than 1 inch in 40 feet toward the drain points when applicable.

Open ends of pipe lines and equipment shall be properly capped or plugged during installation to keep dirt or other foreign matter out of the system.

RECEIVING AND HANDLING SHIPMENTS

INSPECTION: Each shipment shall be inspected with care on its arrival. The products are carefully loaded at the plant using methods acceptable to the carrier and it is their responsibility to deliver the pipe in good condition. It is the responsibility of the Installation Contractor to ascertain whether there has been any loss or damage. The carrier is the contractor's agent. Any pipe or equipment that arrives damaged or is lost in shipment shall be reported by the contractor.

Perform an overall inspection of the load. If load is intact, ordinary inspection while unloading should be enough to make sure that the pipe has arrived in good condition. It is the responsibility of the receiver to make certain that there has been no loss or damage. Note specifically that any end packaging should not show signs of damage. If the load has shifted, or end packing damaged, then each piece must be carefully inspected for damage. Check total quantities of each item against the tally sheet (pipe, fittings, etc.) Any damaged or missing items are to be noted on the delivery receipt and the receipt returned to the carrier. Notify the carrier immediately and make claim in accordance with the carrier's instructions. Thermal Pipe Systems, Inc. will assist, if necessary, in handling this claim. Do not dispose of damaged material - the carrier will notify you of the procedure to follow.

UNLOADING INSTRUCTIONS: The means by which the pipes are unloaded in the field is the decision and responsibility of the installing contractor. The use of mechanical equipment frequently simplifies and speeds up the unloading of larger sizes and usually provides extra protection against damage in handling. To prevent the possibility of the core pipe from shifting within the casing pipe, do not stand a length on one end or raise it vertically. Under no condition should a

pipe be dragged along the ground. Do not lift fittings or pipe by inserting a bar, pipe, etc., inside of the core. Damage to the pipe may result. Care should be taken not to crack the material covering the anchor plates since this could possibly cause an air leak when testing the field joints. If any pipe is damaged in unloading and handling, mark the damaged area and set it aside. A Thermal Pipe Systems, Inc. representative will determine whether damaged casing can be repaired in the field and will determine exact method for repair and instruct the contractor in making the repair.

STORAGE: Store pipe on a flat surface so as to support the barrel evenly. Store random lengths separately where they will be readily available. Individual lengths of pipe should be stacked in piles no higher than 5 feet.

> **PLEASE NOTE:** All pipe will be shipped with factory sealed ends to protect the insulation from moisture infiltration. It is Imperative that the installer keeps these seals in place until final field joint is complete. Under no circumstances should water be allowed to enter the insulation before the FRP casing joint overwrap is complete.

LOADING TRANSFER TRUCKS: Use trucks with long bodies so that pipe lengths do not overhang. Make certain truck bed is smooth, without cross-strips, bolt heads, or other protrusions that could damage the pipe. Short body trucks may be used if fitted with racks that properly support the pipe in a horizontal position. The rack should support the pipe with supports spaced every 3 feet or less along the pipe lengths. Pad the contact areas to avoid damage to the pipe.

DISTRIBUTING PIPE ALONG TRENCH: Pipe lengths may be strung along the line of the trench to minimize additional handling during installation. Do not remove protection materials from the pipe ends until the pipe is lowered into the trench and ready for assembly.

EXCAVATION: Excavation should consider the need for the concrete anchors at required fittings that are directly buried in the ground. The trench bottom must give uniform support along the entire length of any pipelines. Where several pipelines are in a common trench, the trench must be wide enough to maintain the specified distances between adjacent lines, generally a minimum of 6" in pipe sizes up to 6" diameter, and 12" minimum in sizes 8" and up. The excavation should be in a straight line except where fittings are located.

TRENCHING: Trenching shall follow the elevations provided by the Design Engineer. Keep excavations free of water during construction. If the contractor determines it is necessary to remove unsuitable material to a depth greater than specified, refill excavations carried below the depths indicated or directed with specified bedding material and compact in 6 inch lifts to 95 percent of maximum density in accordance with ASTM D1557,

Method D. Excavate and replace soil disturbed and weakened by the contractor's operations or soils permitted to soften from exposure to weather, with bedding material and compact with a plate-type vibratory compactor. The minimum burial depth shall be a 30" cover over the pipe casing. Lesser depths could result in undesirable ground surface temperatures.

TRENCH WIDTHS: The width of the trench at the top of the pipe should be held to the minimum required for efficient and proper installation. The reason for this is to keep the earth load on the pipe as small as possible, since, in general, the wider the trench at the top of the pipe, the greater the load on the pipe. Note that an increase on trench width above the top of the pipe, by sloping the sides or digging a wider offset trench, does not affect the earth load on the pipe. On the other hand, a trench that is too narrow will make assembly difficult and may reduce the rate and quality of installation. In addition, lack of ample room will limit the capability to properly backfill and tamp around the pipe. Although each job or portion of a job must be considered on an individual basis, as a rule, the following minimum trench widths at the top of the pipe are recommended: Minimum: One foot greater than the outside diameter of the casing. Where two or more pipes are in the same trench, use the distance between outside casing of the outside pipes plus one foot. Maximum: Use above method for minimum plus two feet.

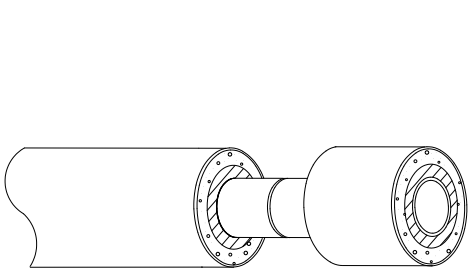
PLACING PIPE IN THE TRENCH: The Super Weld-Tite pipe shall be mechanically passed into the trench. The latest state and federal safety regulations should be understood and observed. If slings are necessary use only canvas straps, no cable or chain slings shall be used.

BEDDING: The pipe should be bedded in accordance with basic good practices that apply to all buried pressure pipelines.

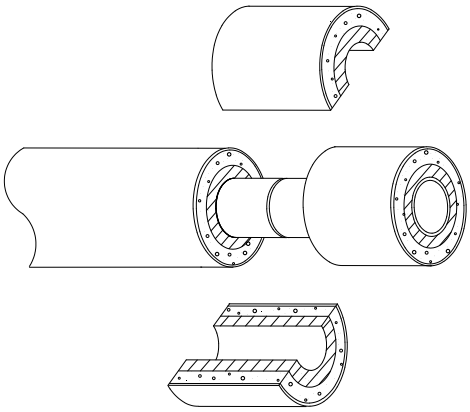
WELDING: End covers should remain in place until welding operations are ready to begin. System sections including fittings and loops should first be laid out and aligned. Welding procedures shall be in accordance with contract specifications, ANSI B31.1 and good welding practices.

TESTING: All carrier pipe joints shall be tested in accordance with the contract specifications before applying field joints. If no test is specified, it should consist of a hydrostatic test of 150 psi or 1 1/2 times working pressure, which ever is greater, for a period of two hours.

INSULATE FIELD JOINTS: After successful testing of carrier pipe joints, the welded joints should be insulated using the insulation kits supplied by Thermal Pipe Systems, Inc.

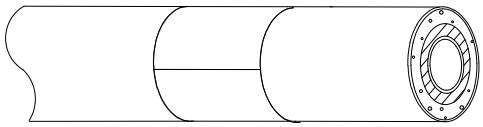


1. Weld pipe

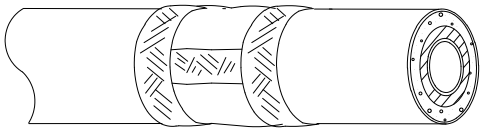


2. Apply field joint half shell

First weld carrier pipes together. Then attach field joint half shells. Next sand the circumferential and horizontal joints. Apply FRP wrap first to the two horizontal joints and then to the two circumferential joints. The field applied FRP wrap should extend 3" on each side of joint. After FRP wrap is cured and hardened apply wraparound heat-shrinkable sleeve on field joint. Detailed field joint procedures are to be supplied by Thermal Pipe Systems, Inc.



3. Close joint



4. Apply FRP wrap and shrink sleeve

TESTING OF FIELD JOINTS: All field joints are to be air tested at 5 psi for 2 hours before backfilling commences.

BACKFILLING: Backfilling of trenches shall progress as rapidly as construction, testing, and acceptance of work permits. Uniformly compact and grade bottom of trenches. After installation of bedding material and pipe, place backfill as follows:

Place initial backfill by hand to a depth of 12 inches over the top of the pipe or casing. Compact the material to a density equivalent to the surrounding undisturbed soil or to 90 percent of maximum density (ASTM D1557, Method D), whichever is greater. Backfill remainder of

trench in one-foot lifts and compact as above. For trenches excavated in roads, streets, or located under structures, place backfill in 6-inch layers to the top of the trench and compact each layer to at least 95 percent maximum density (ASTM D1557, Method D).

START-UP PROCEDURE: Start-up procedure shall conform to generally accepted practices and be done in a workman-like manner. Improper start-up of high temperature lines may damage the piping system and attached equipment.

MANUFACTURERS WRITTEN CERTIFICATION: After testing and prior to start-up of the system, the manufacturer must certify in writing that the system was installed per the manufacturer's installation instructions.